

Remarks of Richard C. Levin
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The University in Service to Society

Artemis, thank you for that kind introduction. To the students and faculty gathered today, thank you for joining me this morning. I am greatly honored by the invitation to speak to you today.

I have been asked to discuss how universities serve society. This is a question well worth asking at a time of active debate about changes to the Greek Constitution to liberalize the rules concerning non-profit universities. To answer the question, I will draw mainly on the experience of American universities, not because their contributions are unique or more important than those of universities elsewhere. I focus on the U.S. experience strictly because I know it best, and I do so in full recognition that some of the lessons learned in my country may not apply directly to Greece.

So let me go straight to the answer. I believe that universities serve society in many ways, but I will focus on the contribution that they make through three activities in particular: research, education, and institutional citizenship.

First, by advancing knowledge of science, technology, and medicine, universities create the foundation for economic growth, material well-being and improvements in human health.

Second, by educating students to be capable of flexible, adaptive, and creative responses to changing conditions, universities strengthen society's capacity to innovate.

And, third, by serving as models of institutional citizenship, universities make a direct contribution to social betterment and inspire their students to recognize an obligation to serve.

Let me discuss each type of service to society in turn.

University Research as an Engine of Economic Growth

In the modern economy, global competitive advantage derives primarily from a nation's capacity to innovate, to introduce and to develop new products, processes, and services. And that capacity depends in turn on the continued advance of science.

As the principal locus of basic research, universities play a key role in sustaining competitiveness and economic growth. Basic research, by definition, is motivated by curiosity and the quest for knowledge, without a clear, practical objective. Yet basic research is the source from which all commercially oriented applied research and development ultimately flows. I say ultimately because it often takes decades before the commercial implications of an important scientific discovery are fully realized. The commercial potential of a particular discovery is often unanticipated, and it frequently extends to many unrelated industries and applications. In other words, the development of innovative products and services that occurs today usually depends on advances in basic research achieved ten, twenty, or fifty years ago — most often without any idea of the eventual consequences.

The emergence of universities as America's primary basic research machine did not come about by accident. Rather, it was the product of a wise and farsighted national science policy, set forth in an important 1946 report that established the framework for an unprecedented and heavily subsidized system in support of scientific research that has propelled the American economy. The system rested upon three principles that remain largely intact today. First, the federal government shoulders the principal responsibility for financing basic science. Second, universities – rather than government laboratories, non-teaching research institutes, or private industry – are the primary institutions in which this government-funded research is undertaken. This ensures that scientists-in-training, even those who choose industrial rather than academic careers, are exposed to the most advanced methods and results of research. And, third, although the federal budgetary process determines the total funding available for each of the various fields of science, most funds are allocated, not according to commercial or political considerations, but through an intensely competitive process of review conducted by independent scientific experts who judge proposals on their scientific merit alone. This system of organizing science has been an extraordinary success, scientifically and economically.

The second and third of these central principles are worth emphasizing because of the impact they have on education and well as research. To isolate the nation's best scientists in research institutes, as was common in the Soviet Union and to some extent in China, deprives the nation of important benefits. It limits the exposure of students, especially undergraduates, to first-rate scientists and, often, to state-of-the-art

equipment and methods, which tend to concentrate in the institutes housing the top scientists. Moreover, by removing many of the very best scientists from the university environment, the quality of teaching suffers and the curriculum is less likely to incorporate the latest advances and novel thinking.

Allocating research resources by means other than peer review of proposals submitted by individuals and groups also imposes a huge cost on national systems. In most European countries, political considerations dominate the process of allocating research funds to institutions. There is a powerful tendency toward spreading resources across a large number of institutions. And, even in Britain, where there is rigorous peer review, the bulk of grant funding is awarded by considering the quality of departments taken as a whole rather than judging the merit of specific proposals from individuals. This also tends to shave the peaks of excellence.

Ensuring that world-class science is conducted in universities should be an important objective of national science policy. The three principles I have identified – adequate government funding, co-locating advanced research and teaching in universities, and peer review that focuses on the merits of individual investigators – have helped the U.S. achieve excellent performance.

To ensure that university-based scientific research truly contributes to national well-being, ideas must move from theory to practice. Historically, most U.S. universities did not actively seek to participate in the translation of discoveries into new products, processes, and services. An exception was the Massachusetts Institute of Technology. By the mid-1990s, graduates of MIT had founded over 4,000 companies nationwide, and

were continuing to create an additional 150 companies a year. Illustrating the impact a university can have on its local economy, more than 1,000 of those companies are based in Massachusetts, accounting for about 25 percent of all manufacturing activity in the state.

If engagement with industry was once the exception among U.S. universities, it is now the norm. Since 1980 over 5,700 companies have been formed based on technology licensed by a university. The shift occurred in part because in 1980 the federal government granted universities the intellectual property rights to inventions made during the course of government-funded research. This simple change created powerful incentives for faculty and their universities to commercialize faculty inventions in order to promote economic development and create additional sources of revenue for academic programs. Many universities in the U.S., like Yale, have sought to use their own research to stimulate the economic development of the city or region in which they are located.

Educating Students for Innovation and Leadership

The knowledge created by the enterprise of academic science is by no means the only important contribution that universities make to the welfare of their societies. By educating students and preparing them well for service across the range of occupations and professions, universities contribute at least as much through their teaching as they contribute through their research. The very best of America's universities and colleges

educate students to be creative, flexible, and adaptive problem-solvers, capable of innovation and leadership.

The world we live in is constantly changing. New scientific discoveries are made every day, and new theories displace old ones with relentless regularity. Many successful companies produce products or services based on technology or marketing strategies that did not exist a decade or two ago. And government officials, too, confront a world radically altered by changes in communications technology and new tasks that are dictated by increasing globalization. In such a world, knowledge of a given body of information is not enough to survive, much less thrive; scientists, business leaders, and government officials alike must have the ability to think critically and creatively, and to draw upon and adapt ideas to new environments.

The methods of undergraduate education used by America's most selective and distinguished universities and liberal arts colleges are particularly well suited to prepare students for a changing world. These institutions are committed to the "liberal education" of undergraduates. The premise underlying the philosophy of liberal education is that students will be best prepared for life if they can assimilate new information and then reason through to new conclusions. Since any particular body of knowledge is bound to become obsolete, the object of liberal education is not to convey any particular content, but to develop certain qualities of mind: the ability to think independently, to regard the world with curiosity and ask interesting questions, to subject the world to sustained and rigorous analysis, to use where needed the perspectives of more than one discipline, and to arrive at fresh, creative answers.

Society gains most from a pedagogy that seeks to enlarge the power of students to reason, to think creatively, and to respond adaptively.

What does this mean in practical terms? It means that, in the best universities and colleges, education is not a one-way street. Information is not simply conveyed from faculty to students and reproduced on examinations. Even as recently as the 1930s and 40s in the United States, in many college classes, professors spewed forth information in lectures, students copiously took notes, memorized them, and then "recited" them back to the professor when called upon in class. Today, students cannot simply rely on a good memory to succeed in college. Although lectures are still used in many courses, they are supplemented by other forms of pedagogy, and students are no longer encouraged to recite back what they hear in class or read in a textbook. Instead, students are encouraged to think for themselves – to offer their own opinions and interpretations in participatory seminars, writing assignments, and examinations.

The participatory seminar is now a fundamental part of most undergraduate and graduate programs at America's top universities and liberal arts colleges. The purpose of small seminars is to challenge students to articulate their views and defend them in the face of classmates and the professor, who may disagree. The format forces them to reason through issues and to think critically for themselves, not just repeat what a professor has told them or what they have read. Often, these seminars are accompanied by in-depth research and writing assignments, where students are required to engage in independent study and write a paper articulating and defending their own conclusions.

Even most lecture classes for undergraduates have some form of discussion section attached to them, to give students the opportunity to discuss for themselves the materials being presented in lecture. Like the participatory seminar, these discussion sections consist of relatively small numbers of students, and, especially in the humanities and social sciences, they emphasize exchanging views and developing analytical skills, not memorization and recitation.

Professors also encourage critical thinking by the form of writing assignments they require and by the kind of examination questions they ask. Exams emphasize analysis and problem solving rather than description and memory. Many exam questions do not have a correct answer; they are designed to see how well a student can draw upon the facts and theoretical explanations at their disposal to fashion a coherent and defensible argument of their own.

This distinctive emphasis on critical thinking produces graduates who are intellectually flexible and open to new ideas, graduates equipped with curiosity and the capacity to adapt to ever-changing work environments, graduates who, in business, can convert new knowledge into new products and services and who, in government, can find innovative solutions to new challenges.

The University as a Local Institutional Citizen

I would like next to explore with you one more way in which universities can contribute to society – by being good institutional citizens both locally and globally. In both cases, acts of institutional citizenship make a direct contribution to human welfare,

but they also contribute indirectly by modeling good citizenship for our students, thus helping to inculcate in them a sense of social responsibility.

When I became Yale's President in 1993, the city of New Haven, Connecticut was deeply troubled. It was suffering from the absence of industrial investment and job creation, a partially abandoned downtown, blighted neighborhoods, and an unflattering external image. Ten years later, a feature article in the *New York Times* travel section called New Haven "an irresistible destination."

When I took office, we decided to develop a comprehensive strategy for civic engagement, create administrative infrastructure to support that strategy, and make a substantial, long-term commitment to its implementation. We recognized that the most enduring contributions we could make would require partnership with public officials and neighborhood interest groups in New Haven, but we knew this would take time to develop. To signal emphatically to both the university community and the city the seriousness of our commitment, we took two important unilateral steps during the first year of my tenure. First, to demonstrate institutional endorsement of the prodigious volunteer efforts of our students, we established a program of paid summer internships to support the work of students in city agencies and nonprofit service organizations. Second, to stimulate immediately the process of strengthening neighborhoods, we announced what has become the most visible and successful of our urban initiatives: the Yale Homebuyer Program. The program, now widely imitated, subsidizes home purchases by our faculty and staff in the neighborhoods surrounding the campus. Of

the nearly 835 employees who have participated in the program over the last 15 years, 80% were first time homebuyers.

One element of our strategy to become an institutional citizen was to accelerate Yale's effort to contribute to economic development through technology transfer. We sought out faculty with an interest in commercializing their results, used students at our School of Management to prepare business plans, drew upon Yale's extensive connections in the venture capital business to find financing, and helped to find real estate solutions in New Haven. We are seeing results. More than forty new companies have been established in the greater New Haven area, most of them in the field of biotechnology. These firms have attracted over \$2.5 billion in capital.

The development of a strong biotechnology industry in and around New Haven augurs well for the long term, but it did little to address the immediate needs of the low income, inner city neighborhoods that surround our campus. To build trust and credibility, it was essential to establish working partnerships with grassroots organizations and community leaders. Neighborhood partnerships also provided an opportunity to coordinate the enormous talent and energy of our student volunteers and focus on a common purpose.

For example, we worked closely with community residents on plans to develop a large vacant site that sits directly between the university and a new, very attractive low-rise public housing project developed under a federal grant that we helped the city secure. We have built a facility that incorporates a community center, with a computer cluster for school children and heavily used meeting space for community

organizations. We are now in the process of relocating the outpatient health care facility that serves our faculty, staff, and students to the site, where we will engage the neighborhood in numerous health outreach programs.

Several substantial public school collaborations complement our neighborhood efforts. At one high school, over 200 students participate in science courses taught by members of our medical and nursing school faculties, and 65 students live on campus during the summer to study science and work in laboratories. And at the local arts high school, students from our School of Music play an active role in the instructional program.

As a final component of our neighborhood outreach, we have endeavored to make our campus more accessible to local school children. In addition to opening our museums to school visits, which has been the practice for generations, we now make our extensive athletic facilities available to hundreds of children enrolled in the National Youth Sports Program during the summer, and we host a citywide science fair each year.

The University as a Global Citizen: Leading by Example

Let me point to one final example of institutional citizenship. The problem of global warming cries out for a multinational solution: reducing carbon emissions in a way that is equitable and efficient. Developing nations like China and India fear that serious limits on greenhouse gas emissions will unfairly constrain their future growth. Skeptics in the U.S. fear that controlling carbon will impose a large cost on our economy

as well. Yet if we collectively fail to take action, future generations will likely face much larger costs from economic dislocation and environmental destruction.

Universities have an important role in the effort to curtail global warming. Much of the work on climate science that has led to the detection and understanding of climate change was done within our walls, and we have been at the forefront of modeling the economic, social, and environmental impact of rising global temperatures and sea levels. We will also participate in developing carbon-free technologies such as solar, wind, and geothermal power, as well as in finding more efficient ways to use carbon-based fuels.

More recently, universities have begun to play a different role, taking the lead in setting standards for carbon emissions that are substantially more restrictive than those adopted by national governments. In 2005, Yale made a commitment to reduce carbon emissions to 10% below the 1990 level by 2020, which translates to a 43% reduction in our 2005 carbon footprint. This is a reduction in the range of what will be needed to keep global temperatures from rising more than 2 degrees centigrade by the end of the century. It is an ambitious goal. If the nations of the world were to negotiate a reduction of this magnitude in Copenhagen in 2009, we would be taking a giant step toward saving the planet.

And here is the good news. We believe that a reduction of this magnitude is not only possible but also relatively inexpensive. We estimate that we can achieve this goal at cost of less than 1% of our annual operating budget, perhaps no more than one-half of 1%.

We have made this commitment because we believe that in so doing we are being faithful to our mission as a teaching institution. We are leading by example. We have encouraged our sister institutions in the Ivy League to join us in setting a specific goal for reducing carbon emissions. And we are working on eliciting similar commitments from our nine partners in the International Alliance of Research Universities and from the 34 Chinese universities with which we have been working on curriculum reform and other issues over the past four years.

We have no illusion that the collective action of universities will have a measurable impact on global carbon emissions. But we do hope that our action will inspire others to believe that significant carbon reduction is feasible and not exceedingly costly. In leading by example, we hope to make a global carbon compact more likely.

Conclusion

Our efforts to mobilize students and faculty in support of our local community, as well as our efforts to mobilize the global community of universities to demonstrate that greenhouse gas reduction is feasible and affordable, flow naturally from the mission and purposes of our institutions. On our campuses we are devoted to the development of full human potential of our students and faculty. But many outside our walls lack the opportunity to flourish. Locally, our neighbors face more limited opportunity than we. Globally, future generations are threatened by the possibility that climate change will leave them with greater burdens than we ourselves must manage. In both cases, we, with the privilege of education, can help. We can contribute through

our citizenship, as well as through our research and teaching, to the betterment of society.